USDA-ARS | U.S. Wheat and Barley Scab Initiative

FY21 FINAL Performance Progress Report

Due date: July 26, 2023

Cover Page

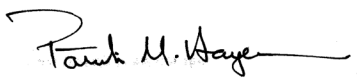
USDA-ARS Agreement ID:	59-0206-0-165
USDA-ARS Agreement Title:	Production of Double Haploid for FHB Resistance
Principle Investigator (PI):	Patrick Hayes
Institution:	Oregon State University
Institution UEI:	MZ4DYXE1SL98
Fiscal Year:	2021
FY21 USDA-ARS Award Amount:	$79,003
PI Mailing Address:	Oregon State University, Department of Crop and Soil Sciences 3050 Campus Way, Corvallis, OR 97331
PI E-mail:	patrick.m.hayes@oregonstate.edu
PI Phone:	541-737-5878
Period of Performance:	6/1/21 - 5/31/23
Reporting Period End Date:	5/31/2023

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
BAR-CP	Barley Doubled Haploid Production for Resistance to FHB and DON Accumulation	$79,003
	FY21 Total ARS Award Amount	$79,003

I am submitting this report as a: ☒ FINAL Report

I certify to the best of my knowledge and belief that this report is correct and complete for performance of activities for the purposes set forth in the award documents.



_____ 7/17/2023

Principal Investigator Signature Date Report Submitted

ǂ BAR-CP – Barley Coordinated Project
DUR-CP – Durum Coordinated Project
EC-HQ – Executive Committee-Headquarters
FST-R – Food Safety & Toxicology (Research)
FST-S – Food Safety & Toxicology (Service)
GDER – Gene Discovery & Engineering Resistance
HWW-CP – Hard Winter Wheat Coordinated Project
MGMT – FHB Management
MGMT-IM – FHB Management – Integrated Management Coordinated Project
PBG – Pathogen Biology & Genetics
TSCI – Transformational Science
VDHR – Variety Development & Uniform Nurseries
NWW –Northern Soft Winter Wheat Region
SPR – Spring Wheat Region
SWW – Southern Soft Red Winter Wheat Region

Project 1: Barley Doubled Haploid Production for Resistance to FHB and DON Accumulation

---

1. **What are the major goals and objectives of the research project?**
   Our major goal was to continue to assist researchers in increasing the efficiency with which they identify and deploy genes and QTLs that contribute to reduction in the losses caused by Fusarium head blight (FHB). We sought to achieve this goal by developing doubled haploid (DH) germplasm from the F1s of cross combinations identified by collaborating breeders. DH's are complete homozygotes that provide unequivocal genotyping and phenotyping data. We proposed to offer speed breeding as an alternative path for achieving a rapid approach to homozygosity when germplasm is recalcitrant in the DH production process. We proposed to supply tissue of DH populations to the Pullman Regional Genotyping lab for molecular marker profiling.

Our project objectives were to:

1. Produce ~ 2,000 green plantlets (GP) from the F1 donor plants with the expectation of producing ~ 1,000 fertile doubled haploid (DH) plants.
2. Submit lyophilized tissue of DH for genotyping with a SNP platform at a USDA Regional Genotyping Center.
3. Produce seed from the DH and ship seed to cooperators.
4. Ensure cooperators receive genotype data from the USDA genotyping Center.

Our plan to accomplish goals was:

1. Receive F1 seed no later than June 1 from the collaborating research group(s) identified by the CP Steering Committee (CPSC) as having the greatest potential to have economic impact and to contribute to the fundamental body of knowledge.
2. Grow F1 donor plants.
3. Produce ~ 2,000 GPs from the F1 donor plants.
4. Produce ~ 1,000 DHs from the GPs.
5. Lyophilize leaf tissue from the DHs and send to a USDA Regional Genotyping Center. Ship DH seed to cooperators.

2. **What was accomplished under these goals or objectives?** *(For each major goal/objective, address these three items below.)*

   a) **What were the major activities?**
   Our doubled haploid production cycle is not synchronous with the report timeframe. Therefore, we report numbers of DHs produced from the 2020-2021 production year and numbers of GPs for the 2021-2022 production year. The following graph shows the chronology of DH production during the report timeframe of 6/1/21 to 5/31/23. Starting with the full cycle of the 2021-2022 production year and the beginning of the 2022-2023 production year.

Month	F1s to vernalize	F1s in greenhouse	F1 tillers to lab	Tissue culture	Green plantlets to vernalize	Transplant DH to greenhouse	Greenhouse DH seed production	Harvest DH	Calendar Year
June									*2021*
July									
August									
September									
October									
November									
December									
January									*2022*
February									
March									
April									
May									
June									
July									
August									
September									
October									
November									
December									
January									*2023*
February							*overlap*		
March							*overlap*		
April							*overlap*		
May									

b) What were the significant results?

2020-21 PRODUCTION YEAR:

Project completed in 2022. Number of doubled haploids produced per cross.

ID	Program	Pedigree	Doubled Haploids
C1	Oregon State	DH120304/Mateo	32
C2	Oregon State	DH142000/Mateo	418
C3	Oregon State	DH140963/Mateo	136
C4	UC Davis	Francine/B9K62	56
C5	Oregon State	Somerset/DH141225	431
Total			***1073***

2021-22 PRODUCTION YEAR:

Crosses received. Lab and greenhouse work continued. Number of green plantlets per cross produced during funding period.

ID	Program	Pedigree	Green Plantlets
D1	Nebraska-Lincoln	NB17411/2ND38517	285
D2	Nebraska-Lincoln	NB15415/2ND38517	388
D3	Virginia Tech	Avalon(VA16M-81)/ARS15B12	257
D4	Virginia Tech	ARS15B12//VA16M-84/Calypso	558
D5	Ohio State	DH02FL-028/2WI15-8688	568
Total			***2056***

c) List key outcomes or other achievements.

After considerable discussion, genotyping collaboration shifted from the Pullman genotyping lab to the Fargo lab.

The following populations from the 2020-21 Production Year were selected for 3K genotyping, based on the number of lines produced. Genotype data are available at T3.
C2: DH142000/Mateo (190 DHs)
C5: Somerset/DH141225 (190 DHs)

3. What opportunities for training and professional development has the project provided?

Professional expertise enhanced, but COVID constrained personal interactions.

4. How have the results been disseminated to communities of interest?

DH seed was delivered to cooperators.
Genotype data available at T3.

Publications, Conference Papers, and Presentations

Please include a listing of all your publications/presentations about your FHB work that were a result of funding from your FY21 grant award. Only citations for publications published (submitted or accepted) or presentations presented during the **award period** should be included.

Did you publish/submit or present anything during this award period?

☐ Yes, I've included the citation reference in listing(s) below.
☒ No, I have nothing to report.

Journal publications as a result of FY21 award

List peer-reviewed articles or papers appearing in scientific, technical, or professional journals. Include any peer-reviewed publication in the periodically published proceedings of a scientific society, a conference, or the like.

Identify for each publication: Author(s); title; journal; volume: year; page numbers; status of publication (published [include DOI#]; accepted, awaiting publication; submitted, under review; other); acknowledgement of federal support (yes/no).

We rely on cooperators to acknowledge our doubled haploid production of their germplasm in publications that they author.

Books or other non-periodical, one-time publications as a result of FY21 award

Report any book, monograph, dissertation, abstract, or the like published as or in a separate publication, rather than a periodical or series. Include any significant publication in the proceedings of a one-time conference or in the report of a one-time study, commission, or the like.

Identify for each one-time publication: Author(s); title; editor; title of collection, if applicable; bibliographic information; year; type of publication (book, thesis, or dissertation, other); status of publication (published; accepted, awaiting publication; submitted, under review; other); acknowledgement of federal support (yes/no).

We rely on cooperators to acknowledge our doubled haploid production of their germplasm in publications that they author.

Other publications, conference papers and presentations as a result of FY21 award

Identify any other publications, conference papers and/or presentations not reported above. Specify the status of the publication.

We rely on cooperators to acknowledge our doubled haploid production of their germplasm in publications that they author.